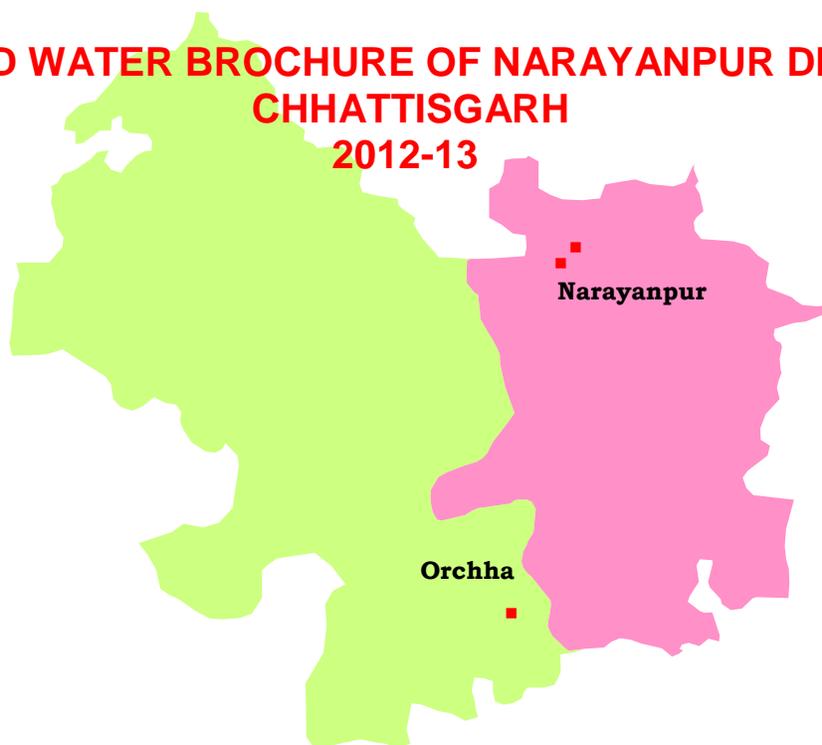


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**Government of India
Ministry of Water Resources
Central Ground Water Board**

**GROUND WATER BROCHURE OF NARAYANPUR DISTRICT
CHHATTISGARH
2012-13**



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**GROUND WATER BROCHURE OF NARAYANPUR DISTRICT, CHHATTISGARH
DISTRICT AT A GLANCE**

I Location

1. Location	: Located in the SSW part of Chhattisgarh State
Latitude	: 19°13'41"- 19°56'46" N
Longitude	: 80°39'51"- 81°30'57" E

II General

1. Geographical area	: 6922.48 sq.km
2. Villages	: 174 nos
3. Development blocks	: 2 nos
4. Population	: 140206
Male	: 70189
Female	: 70017
5. Average annual rainfall	: 1386.77mm
6. Major Physiographic unit	: Predominantly Bastar plateau
7. Major Drainage	: Indravati & Kotri rivers
8. Forest area	: 780.02 sq. km (Reserved) 5287.99 sq. km (Protected) 174.90 sq. km (Revenue) Total – 6242.91 sq.km.

III Major Soil

1) Alfisols	: Red gravelly, red sandy & red loamy
2) Ultisols	: Lateritic soil, Red & yellow soil

IV Principal crops

1) Rice	: 221 ha
2) Wheat	: 08 ha
3) Maize	: 12 ha

V Irrigation

1) Net area sown	: 467.83 sq. km
2) Net and gross irrigated area	: 291 ha
a) By dug wells	: 78 no (21 ha)
b) By tube wells	: 46 no (34ha)
c) By tank/Ponds	: 6 no (163 ha)
d) By canals	: 0 no (0 ha)
e) By other sources	: 21 ha

VI Monitoring wells (by CGWB)

1) Dug wells	: 6 no
2) Piezometers	: 00 no

VII	Geology	: Bengpal and Dongargarh group (granites and gneisses) Abujhmar sedimentaries and Volcanics ,
VIII	Hydrogeology	
	1) Water bearing formation	: Weathered & fractured Granites and Gneisses, Fractured shales,
	2) Water level	
	a) Pre monsoon water level depth (2012)	: 1.70m to 10.37 mbgl
	b) Post monsoon water level depth	: 0.43m to 4.08 mbgl
	c) Water level trend (1997-2012)	: No significant rise and fall
IX.	Ground water exploration (By CGWB)	
	1) Wells drilled	: 05 no
	a) Exploration	: 3 no
	b) Observation	: 2 no
	c) Piezometer	: 0 no
	2) Depth range	: 45 to 124m
	3) Discharge	: 0.5 to 2.33 lps
	4) Transmissivity	: 17 to 25 m ² /day (For Granites)
X	Ground water quality	: Useful for all purposes
XI	Ground water resources(2009)	
	1) Replenishable GW resource	: 45141.31 ham
	2) Net annual available resource	: 40627.17 ha.m
	3) Ground water draft	: 1391.15 ha.m
	4) Available resource for future use	: 39117.11
	5) Stage of ground water development	: 3.42 %
XII	Awareness and training activity	: Nil
XIII	Artificial recharge and rain water harvesting	
	1) Projects by CGWB	: Nil
	2) Projects under technical guidance	: Nil
XIV	Ground water control and regulation	: Nil (No over exploited, critical and notified areas)
XV	Major ground water problems and issues	: Nil

Ground Water Brochure of Narayanpur District, Chhattisgarh

By

K.B.N.Soni, Assistant Hydrogeologist

1. General

The Narayanpur district covers an area of 6922.68 sq. km. It consists of 174 no of villages. For administrative convenience these villages are grouped into 2 no of development blocks. Narayanpur is the district headquarter. The block head quarters are Narayanpur and Chhotedongar(Orchha). The district is known for its forest produce and mineral wealth. **Fig.1** shows the location of the area along with the drainage, block head quarters, location of NHS and location of exploratory wells drilled in the district.

The area is drained by Indravati River and Kotri River, which are tributary to Godavari River. The tributaries for Indravati is Madin whereas and Nibra is tributaries for Kotri. The normal annual rainfall for the district is 1386.77 mm. The annual temperature varies from 10.6°C in winter to 46°C in summer. The relative humidity varies from 90% in rainy season to 30-40% during winter.

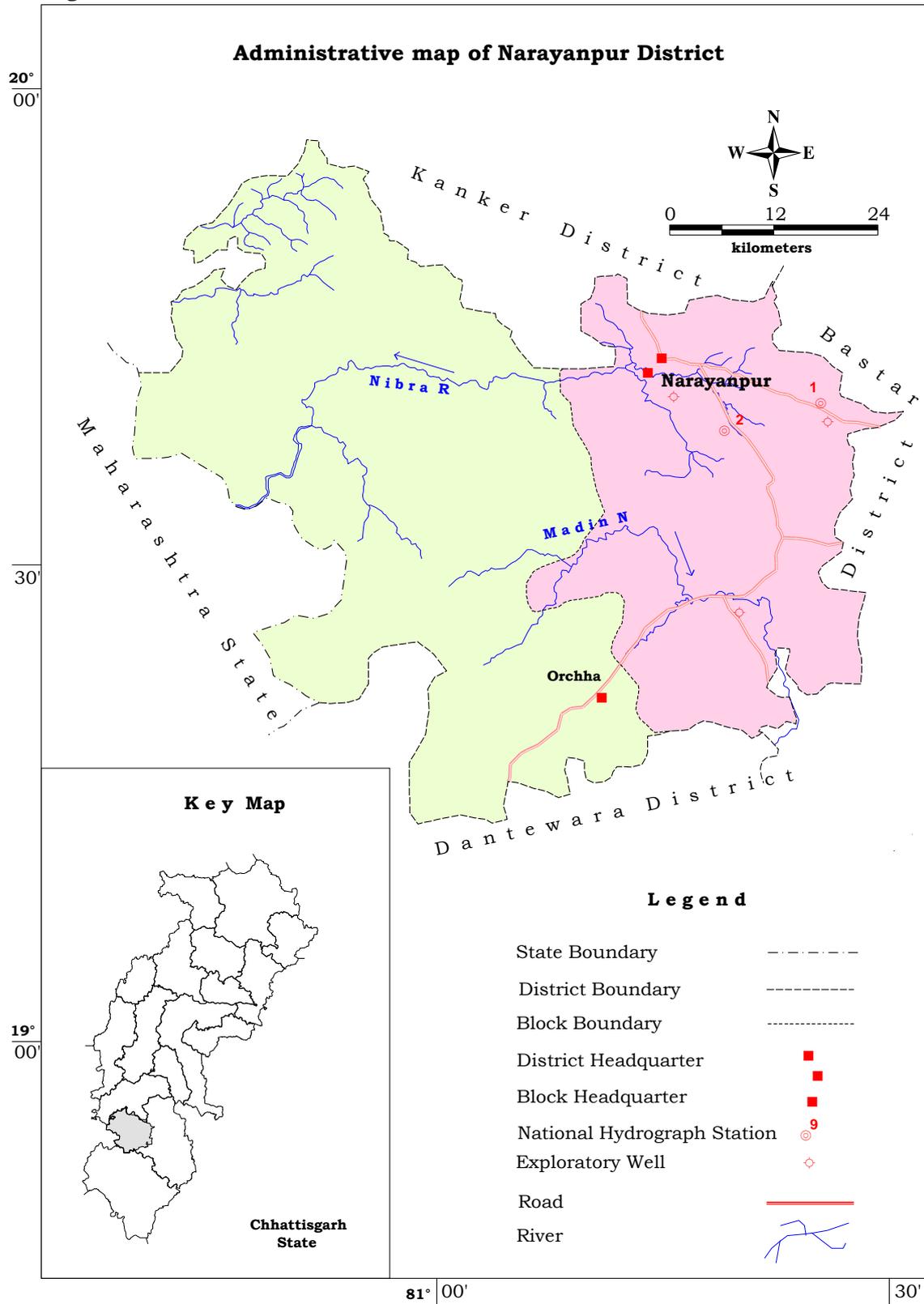
Physiographically the district is a part of Bastar plateau. The maximum altitude is 956 m amsl and is near the village Ghatakala lying in the extreme western part of the district (in Abujmarh protected forest area) and the minimum altitude is 520 m amsl which is on the southern part of the district in Padmeta Reserve forested area, existing near Indravati river . The average elevation is around 600 m amsl. The general slope is towards south and southwest.

The soils in the district are having wide variations. Most of the area is covered by red gravelly, red sandy and loamy Alfisols.As most of the area is covered by crystallines and metamorphic rocks the soils derived by weathering are red soils.. At some places Ultisols in the form of laterites are also present. The trap rocks in the district are occurring as hills rather than plateaus and consequently the trap slopes developed light soils rather than the deep black cotton soil.

2. Geology and Hydrogeology

Geologically the district is covered by metasediments and crystallines of Precambrians constituting Bengpal, Dongargarh and Abujhmar group of rocks. The formations include Gneisses, Granites and matasediments, Basalt and Gabbroic rocks, acid and basic intrusives. The ground water mainly occurs in phreatic (water table) conditions and at places under semi-confined conditions. In granites/gneisses the

Fig. - 1



weathered thickness varies from 13 to 29 m. and the weathered and fractured formations constitute the aquifers. Invariably the fractures are limited to a depth of 21 to 90 m. The hydrogeological map prepared for the district is presented in **Fig .5**.

In all 6 no of observation wells (National Hydrograph Network Stations) were established in the district to monitor water levels 4 times a year and water quality once a year. The pre-monsoon ground water level in the district (**Fig. 2**) varies from 1.70 to 10.37 mbgl and the post monsoon water level (**Fig.3**)varies from 0.43 to 4.08 mbgl.The yield in granites varies from 1 to 2.33 lps. Nearly 23% of the exploratory wells drilled by the department yielded less than 1 lps. About 54 % wells recorded yield in the range of 1 to 2 lps and in the remaining 23% it was more than 2 lps. The Transmissivity value for granites varies from 2.3 to 26.35 m²/day. The salient features of exploratory borewells drilled in Narayanpur is presented in **table 1**The oldest basement crystalline rocks and gneisses belonging to the Bengpal group cover mostly in the central part of the district. The rock formations are mostly hard and compact Pink and Grey granites.

S N	Location	Depth drilled (mbgl)	Length of Casing (m)	Major Lithology Encountered	Zones Encountered	Static Water level (mbgl)	Discharge (lps)	Drawdown (m)	T (m ² / day)
1	Chhotedongar	124.25	19.5	Granite gneiss	37-38, 78-80	5.7	1	29.77	2.3
2	Narayanapur	66.85	58.7	Highly weathered granite	30-60	10.59	2.1	27.7	26.35
	Narayanpur OW	65	62	----do---	36-60	9.2	2.33	20.18	13.85
3	Benoor	106	16	Granite	12.5-14.5, 16-23.6	8.2	1.5	32	13
	Benoor OW	45	16.95	Granite		8.2	1.5		

The rocks of Lower Proterozoic are intruded by dykes and pegmatite veins. The rocks of Lower Proterozoic Dongargarh Super Group, Comprising mainly of fine to medium grained Potash rich granite and its equivalent are distributed in northern and central parts of the district. The area comes under plateau and hilly region. Due to the differential weathering, are common sights in granitic terrain. Well-developed wide joints can also be seen in various areas. Effect of weathering through joints down to 40 meters can be very well observed during drilling in this formation. Intrusives of pegmatite /quartz vein can be often seen in these granites; So far 3 no of exploratory borewells have been drilled in granites and gneisses down to a maximum depth of 124 meters. Based on the drilling data it can be inferred that the weathered thickness varies from 13 meters to 29

meters .Weathered mantle is the main aquifer which holds considerable potential of ground water. Generally the weathered zone is immediately followed by a fracture.

In granite and gneisses the yield of well depends upon structure, lithology and landform. Of these, structure controlled by lineament plays a major role in controlling the yield. Generally the site located along the lineaments or in close vicinity of lineaments have given high yields where as sites away from the lineaments have yielded poorly. Felsic rocks (Pink granite) have more fractures compared to mafic and mafelsic rocks. The depth of wells ranges between 4.5 and 11.24 m.bgl. Based on the exploration data it can be inferred that the weathered thickness in granites ranges between 16 and 40 mbgl. Weathered granite followed by a fracture at bottom is the only aquifer which posses good quantity of water. In general the shallow fractured zone lies within 80 m. depth. The yield of this zone varies from 1 to 2 lps and specific capacity varies between 5 and 12 lpm/mdd.

3. Ground water resource

The ground water resources for Narayanpur district were estimated based on the GEC 1997 methodology and were projected to the year 2009. The estimates indicate that the annual replenishable ground water resource for the district was 45141.31ham. The net annual ground water availability was 40627.17ham. The gross annual draft was estimated as 1391.15 ham, out of which draft for irrigation was 1019.8 ham and for domestic purpose was 371.35 ham. Ground water resource of Narayanpur district (as on 2009) is presented on **table 2**

Table 2 Ground water resource of Narayanpur district (as on March 2009)								
Assessment Unit / Block Command / Non Command	Total Annual Recharge in Ham	Net Ground Water Availability in Ham	Existing Gross Ground Water Draft for Irrigation in Ham	Existing Gross Ground Water Draft for Domestic & Industrial Water Supply in Ham	Existing Gross Ground Water Draft for All Uses in Ham	Allocation For Domestic & Industrial Water Supply in Ham	Net Ground Water Availability for Future Irrigation Development in Ham	Stage of Ground Water Development in %
Narayanpur								
Command	624.97	562.47	354.8	3.62	358.42	4.77	202.9	63.72
Non Command	12939.47	11645.52	641	205.1	846.1	270.78	10733.74	7.27
Block Total	13564.44	12207.99	995.8	208.72	1204.52	275.55	10936.64	9.87
Orchha								
Command	0	0	0	0	0	0	0	0
Non Command	31576.87	28419.18	24	162.63	186.63	214.71	28180.47	0.66
Block Total	31576.87	28419.18	24	162.63	186.63	214.71	28180.47	0.66
DISTRICT TOTAL	45141.31	40627.17	1019.8	371.35	1391.15	490.26	39117.11	3.42

Fig. - 2

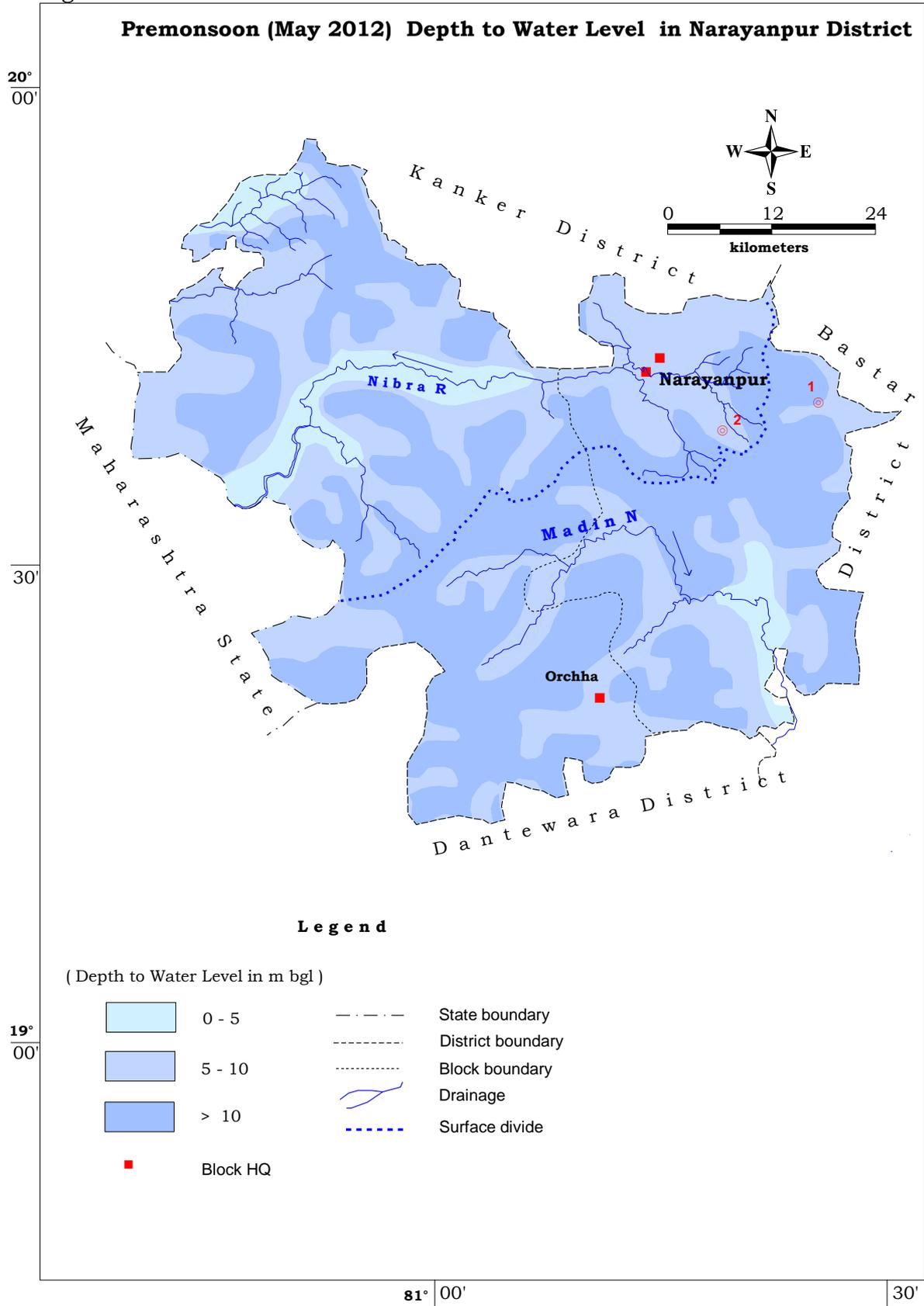
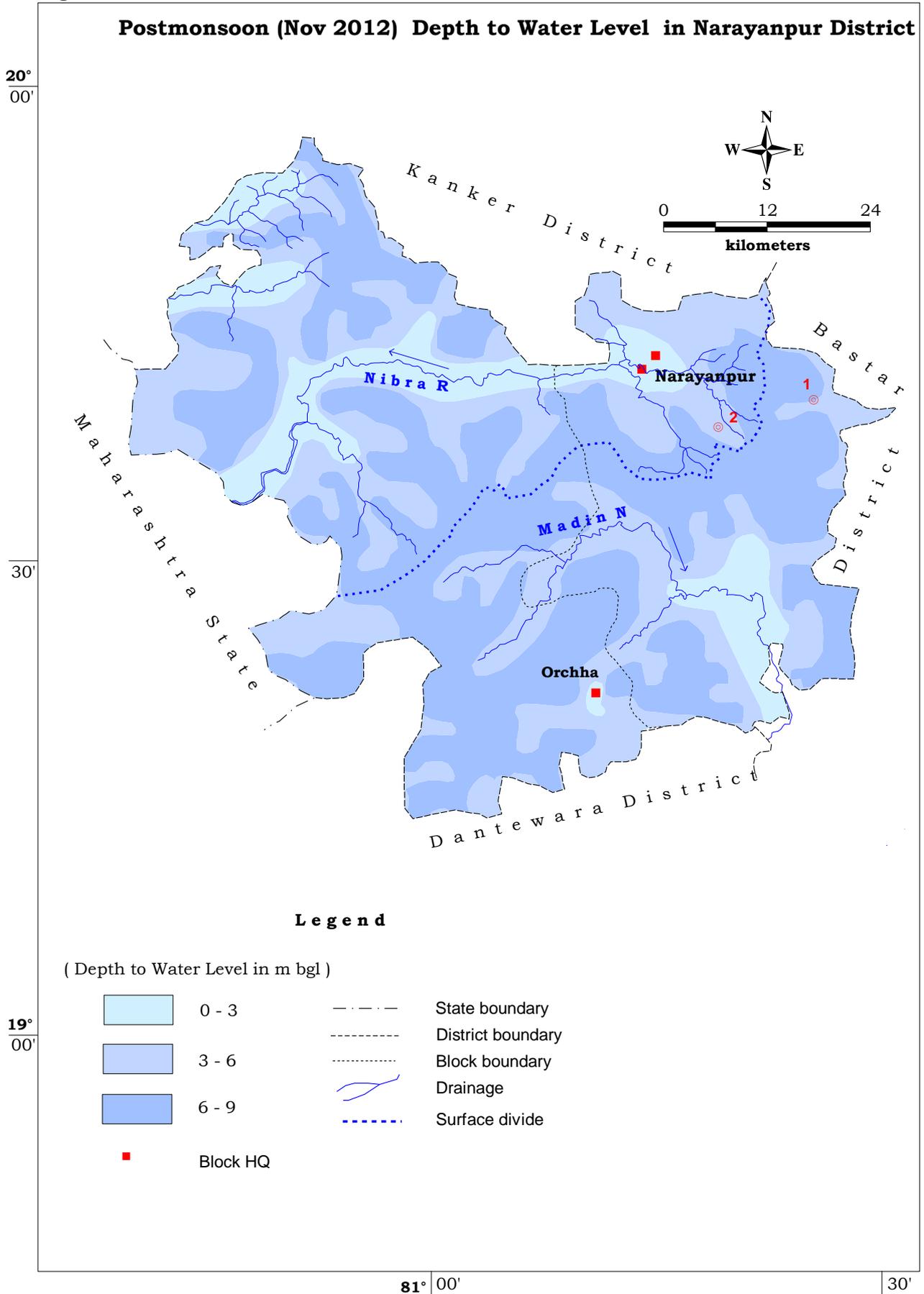


Fig. - 3



4. Ground water development

The stage of ground water development estimated for Narayanpur block is 9.87 % and for Orchha block is 0.66 % . The over all stage of ground water development for the district is 3.42 %.The block wise stage of ground water development in the district is depicted in **Fig .4**. The yield potential and the recommended suitable abstraction structures for the area are shown in **Fig. 6** .

The dug well depth varies from 6 to 15 m and the dia varies form 2.4 to 3.1 m. The bore wells drilled in the area are 60 to 90 m deep with dia varying from 0.10 to 0.15 mm. Diesel or electric operated pumps of 0.50 to 1HP or traditional teda is used to lift the water from dug wells for the irrigation purposes. The electrical pump or rope and bucket are used to lift the water for domestic purpose. Submersible electrical pumps of 3 to 5 HP are used for irrigation purpose in case of bore wells in the area. The bore wells in granitic terrain can irrigate an area of 0.5 to1.5 ha for paddy crops.

Ground water is the main sources of drinking water in the district covering 174 no of villages. In all 46 no of bore wells and 78 no of dug wells exist in the district. Together they irrigate around 55 ha. The contribution of ground water for irrigation comes to nearly 19 % in the district. The use of ground water in non-command area is maximum.

5. Ground water quality

The water samples collected from NHS stations during the month of May 2006 (premonsoon) were analysed to determine the quality of ground water in the district. The analysis shows that the major ions are as per BIS standard and the ground water in the district is suitable for all purposes.

The plot of Piper tri linear diagram and US salinity diagram indicates that the ground water in the district is suitable for drinking, irrigation and all other purposes. The EC values are comparatively high(>750) in the central part of the district . The EC values particularly in granitic terrain range between 255 to 1060 micro siemens/cm at 25°C and the pH values range between 7.8 and 8.2. The over all composition of ground water indicates that it is moderately alkaline and predominantly CaHCO₃ type (Calcium bicarbonate type).

Fig. - 4

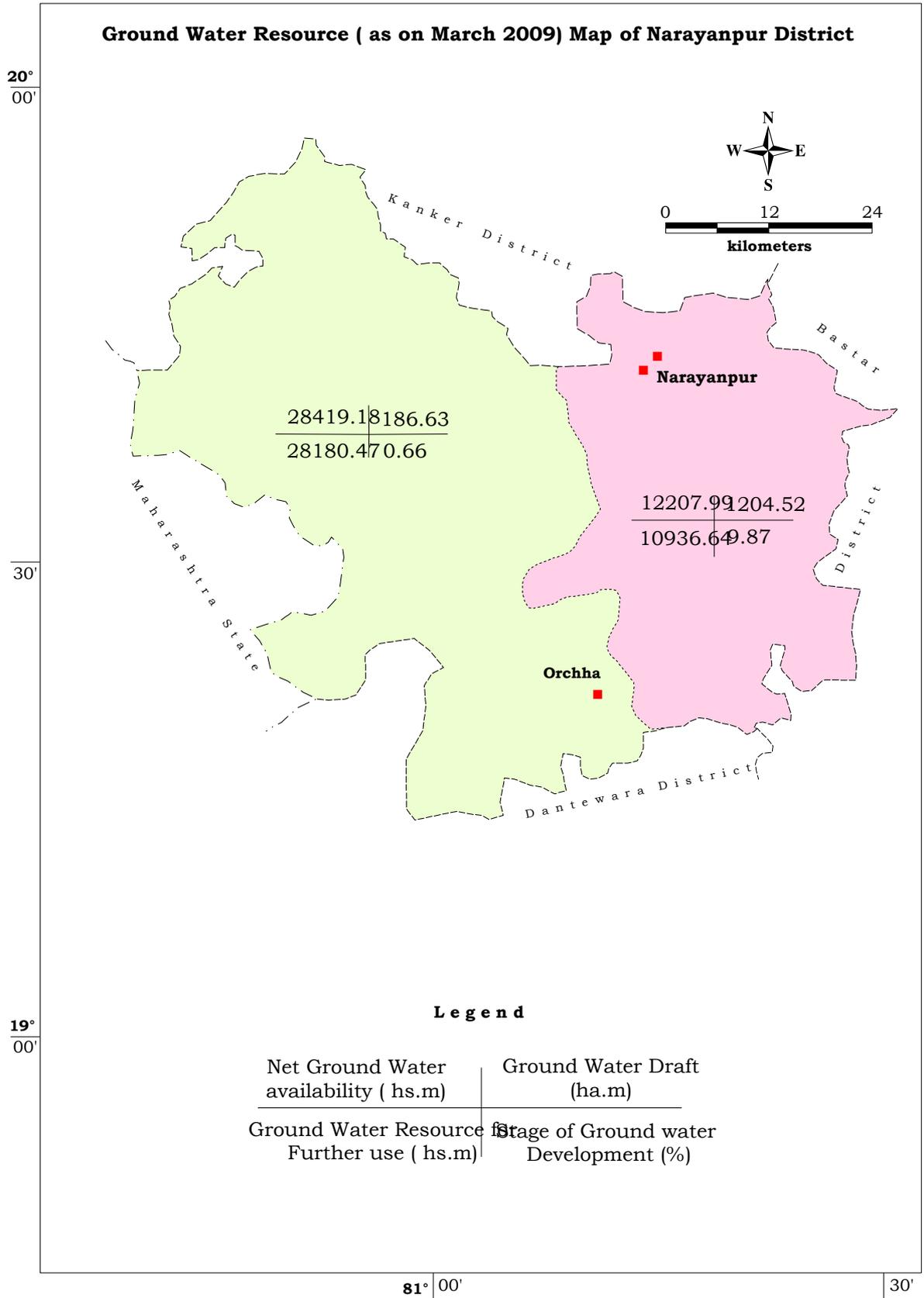
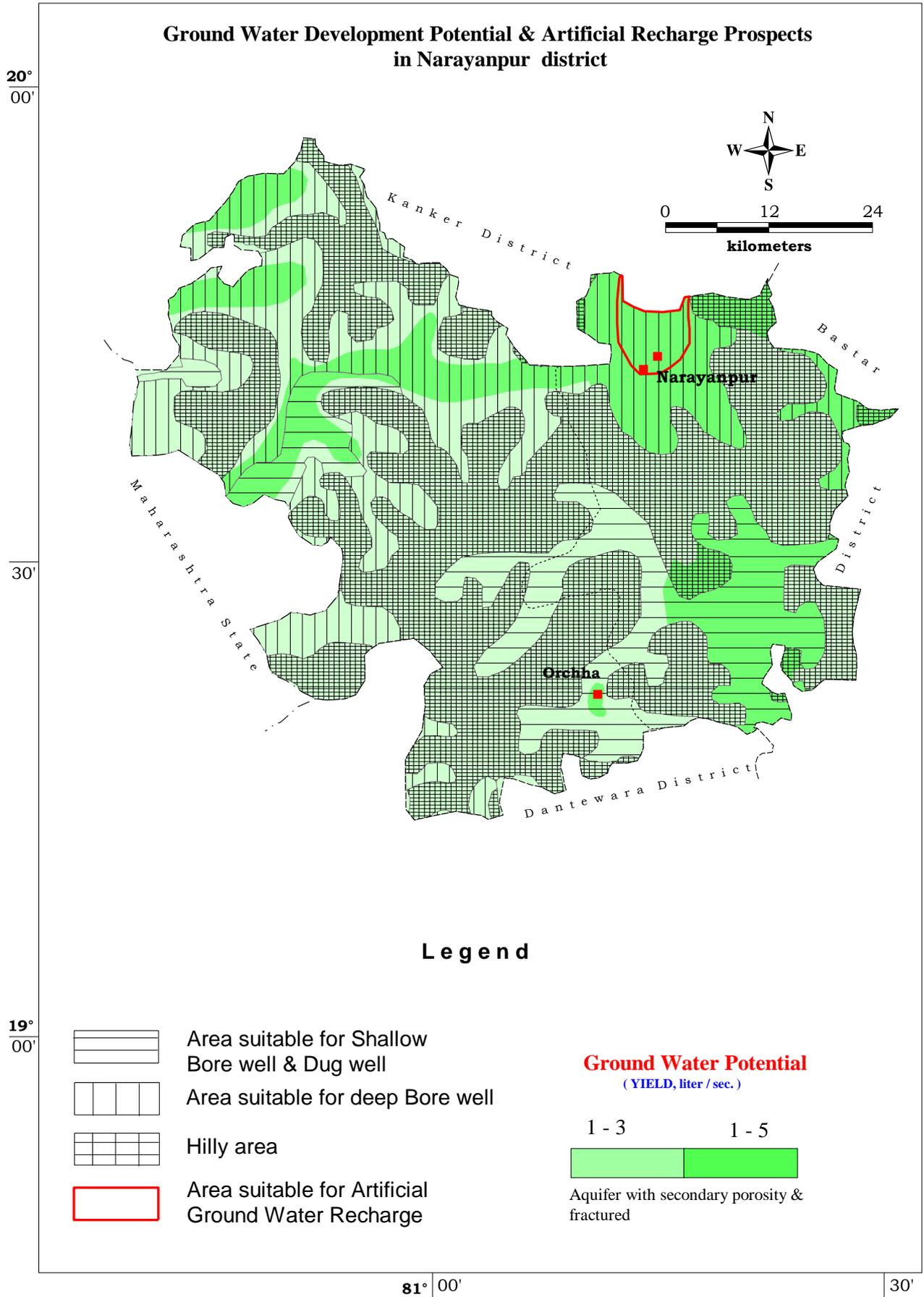


Fig 6



6. Ground water management strategy

There exists a wide scope for ground water development in the district. The available ground water resources for the district are of the order of 40627.17 ham and the ground water draft is 1391.15 ham. The stage of ground water development is only 3.42 %.

7. Water Conservation and Artificial Recharge

The normal annual rainfall for the district is 1386.77 mm. There exist a huge surplus non-committed run off in the district. Rain water harvesting and artificial recharge structures at suitable locations can be constructed to improve the storage capacity of the surface and subsurface reservoirs.

ACKNOWLEDGEMENT

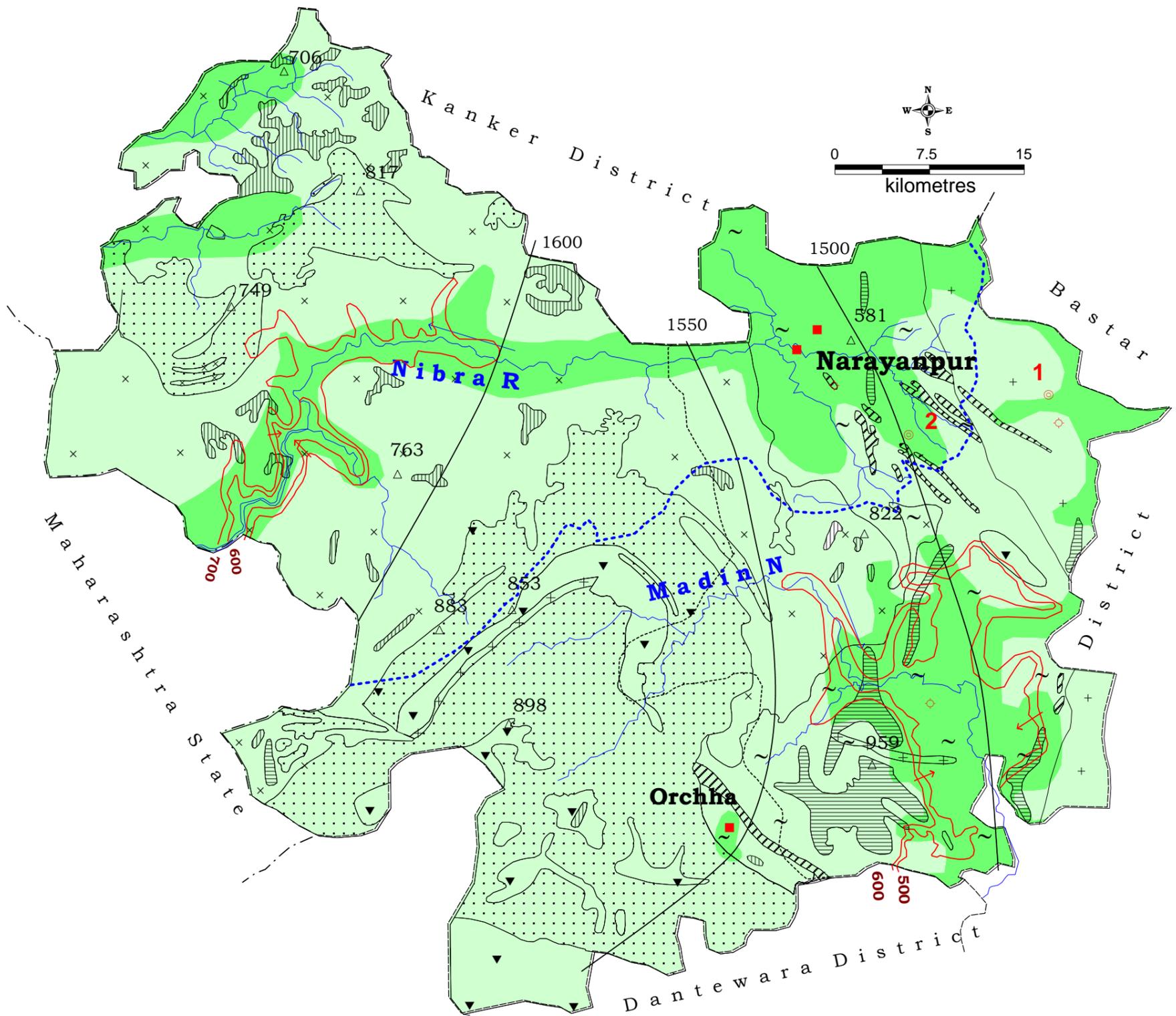
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**K.B.N.Soni,
Assistant Hydrogeologist**

Hydrgeological map of the Narayanpur District



Legend

Group	Formation	Lithology	Ground Water Potential (YIELD, liter / sec.)	
Abujmar group		Laterite	Laterite	
		Intrusives	Quartz veins / Dolerite Dykes	
		Maspur trap	Basaltic and Gabbroic Rocks	
		Gundul Formation	Polymictic conglomerate and sand Stones	
Dongargarh group		Dongargarh Granite	Granite and Granitic rocks	
Bailadila group		Loa Formation	Shale, Sandstone and Conglomerate	
Bengpal group		Bengpal granite	Granite & Gneiss	
		Ultramafic	Granite, Gneiss and meta sediments	
	District Boundary		Ground Water Flow Direction	
	Block Boundary		Fault	
	State Boundary			
	Drainage		Surface Water Divide	